International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 5, Issue 03, March-2019

INCREASED ELECTRICAL YIELD OF PHOTOVOLTAIC PANELS THROUGH MITIGATION OF SURFACE TEMPERATURE COOLING

Prof. (Dr.) Dipesh. M .Patel [1]; Dhruval Prajapati[2]; Jay Mistry[3]; Anad barot[4]

[1]Principal-Ipcowala Institute of Engineering and Technology, Dharmaj, Anand, Gujarat
Director, Gujarat Technological University Innovation Sankul-1

[2,3,4]*Department of Electrical Engg., IIET-Dharmaj*

Abstract: -power generation solar PV is increase since the last few year. Now a day we are using ground mounted PV rooftop PV. canal mounted PV mounting system and the available methods in PV for use of solar energy. The efficiency of solar PV system has dependent on the material which is use for construction electric loss. The main factor which affects the performance solar cell is surface temp of solar cell. In this power to study of cooling of solar panel using water and air.

Key word:- solar cell, temperature dependents performance, ways to cooling, efficiency.

I. INTRODUCTION

Earth receives an abundant amount of solar energy which is approximately 6000 times the current global energy consumption. Effective utilization of solar energy will have the positive impact on global power sector and avoids the emission of CO2 into the atmosphere. Renewable energy is widely used by many countries.PV module 1S most popular renewable energy product. It is basically a sem1 conductor which convert solar radiation nto eat and electricity which can be utilised to power households well as indusurial appliances. module is group of solar cells which are connected electrically and packaged into a frame. These solar cells are commonly made up of silicon but there are also many materials of solar cells. Each material has unique strengths and characteristics that influence it. suitability for secific applications. For example Polycrystalline Thin Films including copper indium diselenidee, and thin-film siliconSingle-Crystalline Ihin Films ncluding high-efficiency material such as gallium arsenide (GaAs). Multi-junction aAs (Gallium arsenide) are the most efficient solar cells till date; triple junction metamorphic cells reached a ecord efficiency of 44% by National Solar Power ResearchInstitute (NCPRI).It indicates that the energy of the absorbed radiation is transferred to the semiconductor. Fig. I shows workıng of the energy activates electrons and allows them to flow freely. The PTmoduleas a semiconductor. This flow of electron represent current and by connecting metal on fop and external use. This current and voltage together makes po that is what solar cell can produce bottom of the PV cells we can draw that current off for.

ηpv=Ppv/GA
Ppv= PV module power (watt)
IM= Maximum PV module current(Ampere)
VM=Maximum PV module current(volt)
ny-PV= module efficiency (%)
G- Global solar radiation (W/ m)
A PV array area (m)

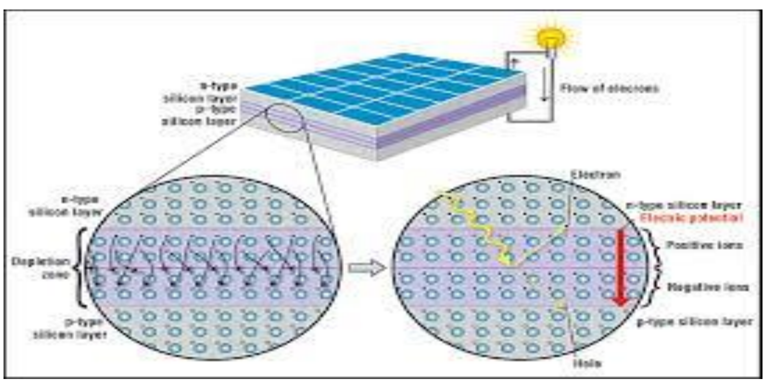

FIG.1 PV CELL WORKING AS A SEMICONDUCTOR.

Only 15% of the incident solar radiation is converted into electricity by typical module, rest of solar radiation is converted into heat,which is primarily responsible for increasing the operatinmtemperature of the PV-Module! [1]. PVMOdule operate similar to a semiconductor its performance deteriorates significantly in elevated temperature[2]. The operating temperature of PV Module has pronounced effect upon its electrical efficiency. The rise in operating temperature results in a linear reduction in the efficiency of power generation of Pohis can bg easily foung on the I-V curve of the panels [3]. Moreover(if the solar cell is operating at short-circuit current (SCC) or at open-circuit voltage (OCC),then its generating no electricity and hence all the power absorbedby the solar-cellis-converted into heat. (A-05%} reduction inconversion efficiency ol crystalline silicon solar cells forevery degree of temperature rise enunciated.

II. Methods of cooling:-

1. Air cooling method:-

The suggested method suffices to cool the solar panels by forced convection of ambient air driven by a blower. The blower is run by power provide by a separate PV penal. Air is passed thought a ground – coupled heat exchanger to drop its temperature. The cooled air cools the solar panels as it passes thought the whole surface of the solar panels which in

fig.

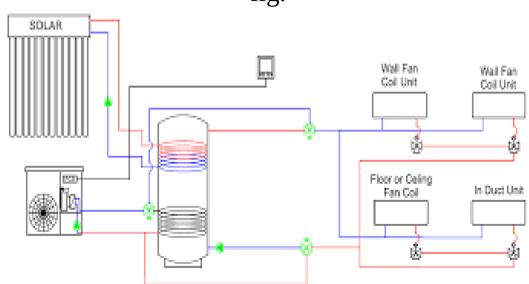

FIG.2 AIR COOLING SYSTEM

The air will be driven by a single blower. This design is similar to central cooling system. The cooled air is distributed to each solar panel by a pipe. Nozzles are provide on the pipe though which the air comes outside. Nozzles ensure that streamlines are developed in the desired direction. A Ground-Coupled heat exchanger in an underground heat exchanger that capture heat from ground and dissipate heat to the ground. They use the Earth`s near constant temperature to warm or cool air for residential use. They are also called earth tubes. Earth tubes are economical compare to conventional central cooling system since there are on compressors, chemicals or burners and only blowers are required to move the air.

2. Fins:-

Fins are mostly used to extend transfer area to enhance conventional heat transfer passively. A device consists of linear fins on all available heat sink surface used for cooling single cells. A further research did on passive cooling technologies and concludes that good thermal conduction between cells and heat spreading plate was important. A modified PV/T system studied involving the interposing of a flat thin metallic sheet at the middle of the channel and rectangular fins attached at the back wall of the channel. And result reviled that the maximum temperature reduction achieves 30 c by forced ventilation and 10 c by natural ventilation.

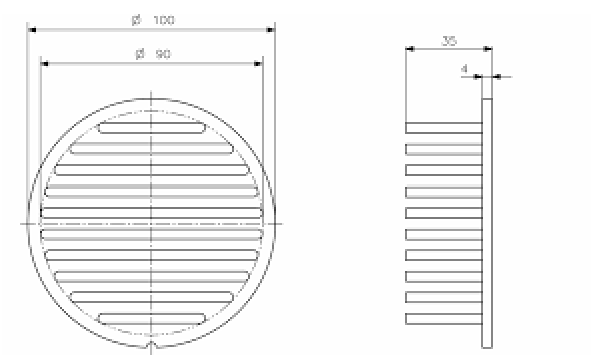

FIG.3 PASSIVE COLING SYSTEM

3. Water:-

Water is a good cooling medium mostly used for PV cooling in various researches, mostly suitable for PV systems. A water-based PV system consisting of mono crystalline PV panels in the Cyprus studied and found an increase of average annual electrical efficiency from 2.8 to 7.7% with 4 year of payback periods. The raised operating temperature of PV arrays was reduced by spraying water over the PV module. Efficiency increase till 3.12 to 12.10% .

A method need of covering PV module with a flowing water film above studied. With the additional evaporation heat transfer, it was claimed that they could decrease the module temperature up to 22 c and net increase in efficiency from 8 to 9% .

FIG 4 WATER COOLING SYSTEM.

Active cooling is more effective to cool PV module. However active cooling requires additional power supply, hence the active cooling purely used for lower down the operating temperature of PV module does not have obvious benefits in net gain of efficiency. Other technologies are also used to decrease the operating temperature of PV module.

III. CONCLUSION.

From these study it is concluded that all three artificial cooling methods will reduce the temperature and increase the power output. from these three methods, water cooling is the best method by compare to other. As the operating temperature of PV module rise it linearly deteriorates its perform and efficiency get decrease. Water is mostly use for cooling of PV cell. The water spray on front of PV surface. However active cooling medium required . all these techniques have significant effect on lowering down the PV module operating temperature result in increasing its electrical efficiency and power output.

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